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PHYSICAL AND ASTRONOMICAL GEOGRAPHY.

Specially designed for Pupil Teachers and Scholarship and Certificate Candidates.

By R. A. GREGORY,

Honours Medallist in Physiography; Solar Physics Committee, the Royal College of Science, South Kensington; Fellow of the Royal Astronomical Society; Foreign Correspondent of the 'Revue Generale des Sciences.'

WITH ORIGINAL ILLUSTRATIONS.

OPINIONS.

One of the best known Educationists of the day writes:—'Mr. Gregory's manual is simply magnificent.'

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London: JOSEPH HUGHES & CO., Pilgrim Street, Ludgate Hill, E.C.

☛ SEE ALSO PAGE 223.

New Inspection Questions.

[We shall always be glad to receive (in strict confidence) *bona fide* Inspection Questions and Drawing Examinations from our readers.—Ed. *P. T.*]

Test Cards for Standard VI.—Boys.

No. 1.

1. In how many days will 48 guineas be spent at the rate of 84 shillings in three days?

2. Reduce 17 yds. 1 ft. 6 ins. to the decimal of one mile.

3. Simplify $\frac{16\frac{1}{2} \text{ of } \frac{1}{11}}{8\frac{1}{4} \text{ of } 1\frac{1}{2}}$.

4. A girl has £450 in the bank. What sum will it amount to in 7 years at $3\frac{1}{2}$ per cent. simple interest?

No. 2.

1. If 48 men earn 196s. in 3 days, what will 144 men earn in 21 days?

2. Reduce $\frac{4}{15}$ and $\frac{5}{7}$ to decimals.

3. Find the value of 0·1625 of £5.

4. A man bought a horse for £150 and sold it for £210. What was his gain per cent.?

No. 3.

1. Simplify $\frac{4\frac{1}{2} - 1\frac{5}{8}}{2\frac{1}{4} + 1\frac{7}{16}}$.

2. Reduce $\frac{1}{17}$ and $\frac{1}{19}$ to decimals, and ·013 to a vulgar fraction.

3. If ·025 of a ton cost £8 10s., what will ·25 of one cwt. cost?

4. A boy can dig a garden in 5 days and his brother can dig it in 6 days. In how many days will they do it if they work together?

No. 4.

1. What fraction of $1\frac{1}{2}$ guineas is 3s. 6d.?

1. If 83 horses consume 107 bushels of oats in 24 days, how many horses would consume $53\frac{1}{2}$ bushels in 18 days?

3. Reduce $\frac{4}{5}$ and $1\frac{3}{8}$ to decimals.

4. A can do a piece of work in 9 days, which B can do in 11 days. In what time will they do it together?

No. 5.

1. Reduce $\frac{3}{4}$ of 2s. 3d. to the decimal of 13s. 6d.

2. Add $\frac{1}{2}$ of 2s. 6d.; $\frac{3}{5}$ of 5s.; $\frac{5}{7}$ of 21s.; and $\frac{7}{8}$ of £1.

3. Divide 77 half-crowns between two persons in the proportion of 2 : 5.

4. If 29 men spend 105s. in 36 days, what would 116 men spend in 18 days?

No. 6.

1. What will 200 guineas amount to in 2 years at 4 % simple interest?

2. Reduce $\frac{11}{17}$ and $\frac{13}{100}$ to decimals.

3. What is the value of ·016275 of 10 guineas?

4. Divide £57 between two girls, giving the one twice as much as the other.

No. 7.

1. If $\frac{3}{4}$ of 2 cwt. cost 12s. what is the value of $\frac{3}{5}$ of one ton?

2. Reduce $1\frac{1}{2}$ of 2s. to the decimal of 10s. 6d.

3. Simplify $\frac{6\frac{1}{2} - 3\frac{3}{4}}{1\frac{1}{2} + \frac{5}{8}}$.

4. Which is the greater, and by how much, ·625 of 20s. or $\frac{1}{3}$ of 21s.?

No. 8.

1. What is the simple interest on 200 guineas for $2\frac{1}{2}$ years at $2\frac{1}{2}$ per cent.?

2. If $\frac{3}{4}$ of $\frac{3}{5}$ of 1 yard of lace cost 7s. 6d., what will 23 yards cost at that rate?

3. Reduce $\frac{3}{11}$ and $\frac{1}{13}$ to decimals.

4. From the sum of $7\frac{5}{8}$ and $8\frac{3}{4}$ take their difference.

Test Questions in Standard VII.—Boys.

No. 1.

1. At what rate per cent. will £225 amount to £450 in 20 years, simple interest?

2. If 45 girls earn £6 15s. in 24 hours, in what time will 20 girls earn £10 2s. 6d.?

3. A watch was bought for 25 guineas and sold at a profit of 25 per cent. What was the selling price?

4. A man can plough a field in 8 days, which his son can do in 10 days. If both work together in what time will they plough the same field.

No. 2.

1. What is the simple interest on £365 for two years at 4 per cent.?

2. I bought a horse for £36 and sold it for £45; what did I gain per cent.?

3. What income should I get from £1,050 invested in the Four per Cents. at 90?

4. Divide one guinea between two girls in the proportion of 2 : 1.

No. 3.

1. A man bought sugar at $4\frac{1}{2}$d. per lb. and sold it at 84s. per cwt. What did he gain per cent.?

2. In what time will £500 amount to £1,000 at 5 per cent. simple interest?

3. A man receives £196 as income from the Three per Cents. at 98. What amount has he invested?

4. Divide £250 between two persons in the proportion of 2 : 3.

No. 4.

1. In what time will £380 amount to £760 at 5 per cent. simple interest?

2. A man bought soap at $4\frac{1}{2}$d. per lb. and sold it the rate of three guineas per cwt. What was the gain per cent.?

3. What income should I derive from an investment of £3,500 in the Four per Cents. at 80?

4. A man bought a watch for £30 and sold it at a profit of $12\frac{1}{2}$ per cent. What was the selling price?

No. 5.

1. I buy an estate for £265 10s. and sell it to gain 33 per cent. What is the selling price?

2. I buy tea at 2 guineas per cwt. and sell it to lose $12\frac{1}{2}$ per cent. At what price was it sold per lb.?

3. If 49 men earn £168 10s. in seven days, what will 147 men earn in 21 days?

4. What does £375 15s. amount to in $2\frac{1}{2}$ years at $2\frac{1}{2}$ per cent. simple interest?

No. 6.

1. A man bought a horse for £57 10s. and sold it at a profit of 15 per cent. What was the selling price?

2. What does £3,050 amount to in $3\frac{1}{2}$ years at $2\frac{1}{2}$ per cent. simple interest?

3. What income does a man derive from an investment of £4,000 in the Three per Cents. at 81?

4. Find the average of 24, 36, 3, $\frac{1}{2}$, $2\frac{3}{4}$ and 9.

A Course of Object-Lessons and Elementary Science.

(Adapted to the Syllabus of the New Code and of the London School Board.)

BY RICHARD BALCHIN,

Head Master under the School Board for London.

In the last article it was stated that the work of Standard III. would embrace, in the first place, an advance in our classification of natural objects; second, a series of experimental simple lessons in physics; and third, a few facts in geographical knowledge. As to classification. In the First Standard we had the three kingdoms, animal, vegetable, and mineral. In Standard II. we advanced to the sub-kingdoms, viz., vertebrate and invertebrate animals; flowering and flowerless plants; rocks and metals. Now we will take the first in each of these groups of sub-kingdoms, and proceed to divide them into classes. We will, for the present, leave invertebrate animals, flowerless plants, and metals out of consideration, so far as classifying them is concerned. We therefore proceed to a classification of vertebrata; and will take as our basis:—circulation, respiration, and mode of birth. Considered under these three aspects, our sub-kingdom divides itself into the five classes: — fish, amphibians, reptiles, birds, and mammals. Now I am perfectly well aware that many other considerations enter into the question of the classification of vertebrate animals besides these three; and not the least of them is the marvellous and most interesting fact of the appearance, in the long course of the Geological ages, of class after class, beginning at the lowest; nay, the gradual merging of class into class, with many connecting and transitional forms, so that it is extremely difficult to draw any sharp line of separation between the classes. But we must remember we are in Standard III. What I particularly wish in these lessons is to impart knowledge that shall be correct as far as it goes: to be absolutely accurate though elementary. I do not want these little boys to have to *un*learn anything when they get older and are inclined to carry their investigation farther. If, in after life, these boys, wishing to build up their store of knowledge, find that they must begin by clearing away the rotten foundation I have laid for them, what a fraud in their eyes shall I appear!

Vertebrate Animals.—Classification.

4. Have ready diagrams of the 'comparative sizes of animals,' the interior organs of a fish, and the chart of human physiology. Get from the boys what they know about the distinction between vertebrate and invertebrate animals. Let the boys name a number of members of the sub-kingdom vertebrata. Write on the board the names of about a dozen, all kinds mixed up together, but be careful to have examples of the five classes into which you propose to group them. Now, as the boys have heard a good deal about classification, ask them how they would arrange the dozen whose names are on the board, into groups. After some considerable amount of chat, and, I may add, offtimes really intelligent suggestions from some few boys, I have found the general conclusion at first reached is a division into *two* classes, viz., animals that can fly, and animals that can't. Then some boy discovers that among the animals that cannot fly there are some that have to live in the water, and others on dry land. Hence the boys arrive at a classification of all the vertebrates into Birds, Beasts, and Fishes; three classes. Some of the youngsters will even be ready with definitions. For 'definitions' is a remarkably easy thing in the case of people who know little or nothing about the objects they are so ready to define. The boys will tell you that a bird is an animal that flies in the air; a fish is one that lives in water; a beast lives on the land, but connot fly. Carry on a conversation about this classification and show its defects. For example, a bat can fly, but is not a bird. An emu cannot fly and *is* a bird. A whale lives in the sea, but is not a fish. Some *fish* can fly. The young frog is a tadpole and is a fish: afterwards it becomes a land animal and cannot live in water; is it a beast like an ox? The teacher must now lead the boys to see that their classification is founded upon the *habits* of animals and is defective. Now suggest another and better basis, viz., the structure of some of the organs, such as the two we have had lessons upon; the organs of circulation—and respiration. Our grouping upon *this* basis gives us the five classes—fish, amphibians, reptiles, birds, and mammals.

Vertebrate Animals.—Fish.

5. Have ready a diagram of the internal organs of a fish; a large picture of the same; and if possible a fresh herring for dissection. Also an 'enema' and basin of water. If there is a school aquarium, have it upon the table. Perhaps the school-keeper or some friend will lend a globe of gold-fish. Talk about the pictures; note the shape; if any boys have model boats, refer to the shape of the hull; *that* shape is best for speed which most nearly approaches the 'lines' of a mackerel. Then talk about the fins. Ask the boys what the gold-fish in the globe appear to be doing? Swallowing mouthfuls of water. Where does this water go to? The fish are really breathing the air which is *in* water. So lead to the gills. Cut open the 'flaps' of the herring and show the gills; or point them out on the picture. In time the air in the water is all used up, so there must be fresh water given, just as *we* require fresh air. No lungs in a fish. Any blood? Yes, and also blood vessels, hence circulation. What is the organ of circulation. The heart. Point out the small heart in the picture, and try and find it in the herring; it is just under the lowest of the four gill-fringes. How many chambers has our heart? Four. Let the boys give their names. The heart of the herring has *two* only; the smaller is the auricle; the larger, the ventricle. Blood from the body enters the former, from which it is pumped to the latter, which in turn drives it to the gills. The blood does not return to the heart, but is at once dis-

tributed all over the body. There is a fish, the lowest in the class, whose heart has only *one* chamber. *Here* the circulation is effected just like the passage of water through an 'enema' which show. The conclusion the boys are to be led to in this lesson is:—a fish is an animal with a back-bone, and breathes *in* water by means of gills, and has a heart with one or two chambers. Finish up the lesson with a chat about sea-fish and river-fish. Also tell the boys that the whale is not a fish, because it has lungs and not gills, and its heart has four chambers.

(To be continued.)

PUPIL TEACHERS' LATIN COURSE.

BY L. HUXLEY, B.A.,

Classical Master Charterhouse School.

This New Latin Course (specially written for Scholarship Candidates) was begun in our issue of February 7th (No. 4., vol. XI.).

Exercise XXI.

1. Rex quondam Angliae erat, nōmĭnĕ Henrĭcŭs, quī jŭventūtēm inter discrīmĭnă multă gess ĕrat. 2. Is, diū exŭl et Inops, tandem domum rĕdĭit; rēgem, quī scĕlĕră multă fēcĕrăt, regnō expŭlĭt; ipse vŏluntātĕ tōtĭŭs cĭvĭtātĭs rex factŭs est. 3. Posteă, quiă jūră suōrum servābat, lēges-quĕ aequās fēcĭt, pācĕ et quiētĕ sē victūrum esse spērēvit; sed multīs conjūrātiōn ĭbŭs pētībus, jam sĕnior regnum consĭlĭō, ŏpĭbŭs, affĭnĭtātĭbus firmātum, princĭpī nōn indignō trādĕre vŏluit.

Translation.—1. There was once a king of England, by name Henry, who had passed his youth among many adventures. 2. He, long an exile and in want, at length returned home; drove from the kingdom (= throne) the king, who had committed many crimes; and was himself made king by the will of the whole state. 3. Afterwards, because he preserved the rights of his (subjects) and made just laws, he hoped to live (he would live) in peace and repose; but, assailed by many conspiracies, he, now growing old, wished to hand-over the kingdom, strengthened by prudence, by wealth, and by marriage-ties, to a prince not unworthy.

Retranslation.—1. The king married a wife from the Arabs, for he hoped to strengthen his kingdom by a foreign alliance. 2. But the chief of the Arabs, whose sister he had married, resolved to drive out the king by treachery, and seize the kingdom. 3. Because he was able to visit his sister, he sought out the disloyal, and with them made a conspiracy.

1. Marry, *in matrimonium dūc-ĕre* (pf. *dux-ī*); wife, *uxŏr*; Arab, *Arăb-(s)*; hoped to —, note the construction in sent. 3 above; strengthen, *firma-*, fut. part. *firmā-tūrus*; foreign, *externo- a-*; alliance, *i.e.*, of marriage, as sent. 3.
2. Whose, the gen. of *quī* is *cŭjŭs*; sister, *sŏrŏr-*; resolve, *stātu-o*, *statu-ī* (constr. + infin.); treachery, *prădĭtiōn-*; seize, *occūpa-*. N.B.—To drive out ... and, may best be turned by abl. abs.: 'the king being driven out' (*expulso-*). Similarly in 3: he sought out ... and (seek out, *exquīr-o*, *exquīsīv-ī*, pf. part. *exquīsīto-*).
3. Visit, *vīs-ĕre*; disloyal, *infīdo-*.

Exercise XXII.

1. At fĭlĭus maxĭmus nullă virtūtĕ praedĭtus esse vīsus est. 2. Hŏmĭnĕs sĭbī ĭnŏpēs, ĭmprŏbōs, princĭpĕ indignos, adjunxĭt. 3. Cum hĭs lūdĕbăt, pōtābăt, făcĭnŏră ĕtiam lĕoltātĕ ănĭmī committĕbat; viātōrēs ĕnim lātrōnĭs mōrĕ pĕtĕbat. 4. Dĭĕ quōdam ūnŭs ex cŏmĭtĭbus ējus in jūs vŏcātŭs est. 5. Hunc, causă dijūdĭcātă, custōdēs in carcĕrem dūcēbant, cum princeps magnō clāmōrĕ praetōrium ingressŭs, castōdĭbus rĕsistĭt, vinctum sibi, ut rēgĭs fĭlĭō, poscĭt; jūdĭcem dēnĭquĕ, nēquĕ prĕcĭbus nēquĕ mĭnĭs inflexum, băcŭlō fĕrĭt.

Translation.—1. But his eldest son seemed to be endowed with no virtue. 2. He attached to himself needy and evil men, unworthy of a prince (note abl. after *dignus* and *indignus*). 3. With these he used to play, drink, even commit crimes through his unstable character (lit., by lightness of mind); for he used to attack travellers in the manner of a highwayman. 4. One day one of his companions was summoned before a court of law. 5. The case being decided, the guards were taking him to prison, when the prince, with great uproar entering the Court, resists the guards (dat.), claims the prisoner for himself as the king's son, and finally strikes with his stick the judge, influenced neither by his entreaties nor his threats.

Retranslation.—1. To the needy he promised riches; to those who had contracted debts, great prizes; to the ambitious, honours; to all he gave gifts and pledges of friendship. 2. This conspiracy made (abl. abs.), he made trial of his sister. 3. 'This kingdom,' he said, 'which formerly belonged to the Arabs, I have long desired to recover. 4. Having obtained this excellent opportunity, I do not wish to pass it by. 5. Take this dagger; by killing the king (abl. abs.) you will be the glory of your country.'

1. Promise, *promitt-*, *-mīs-ī*; contract, *conflа- -vī*; debts, *aes* (neut. *aer-is*), *ălĭēnum* (lit., someone else's money); prize, *praemi-* n.; ambitious, *ambĭtĭōso-*; to all, *omnibus*; gift, *mūnŭs*, *-ĕr-is*, n.; pledge, *pignŭs*, *ĕr-is*, n.
2. Made, *facto- a-*; make trial of, *tenta-* (+ acc.).
3. Which (neut.) *quod*; formerly, *ōlim*; belonged to, tr. was to (dat.); I have long desired, *jamdūdum cūpio* (pres.); recover, *rĕcŭpĕre*.
4. Having obtained, *nactus* (def. pf. part.); excellent, *optimo- a-*; opportunity, *occāsion*, f.; I do not wish, *nōlo*; pass by, *praetermitt-*.
5. Take, *accĭpĕ* (imperft.); dagger, *pūgiōn*, m.; kill, *interfĭci-*, (pf. *fec-ī*, part. *-fecto-*); glory, *dĕcus* (*ŏr*), n.

Exercise XXIII.

1. Tum jūdex, īram princĭpĭs nĭhĭl vĕrĭtŭs, eum quŏque jŭbĕt custōdēs in carcĕrem dūcĕre. 2. Nēquĕ haec rēs regī ipsī patri princĭpĭs displĭcuit. 3. Immō vērō gaudēbat, quiă judex tam aequŭs ĕrat, neque princĭpī ĕtiam pepercĕrat quī majestātem lēgis laesĕrat. 4. Princeps autem, mīrā ănĭmī magnĭtūdĭnĕ, ŭbī ad regnam accesĭt, jūdĭcem tam prŏbum vīsum, summīs hŏnōrĭbus affēcĭt.

Translation.—1. Then the judge, not in the least (lit., nothing, no whit) afraid of the prince's anger, orders the guards to take him also to prison. 2. Nor did this affair displease (with dat., see Ex. xxvii. 1) the king himself, the prince's father. 3. Nay, rather he rejoiced, because the judge was so impartial, and had not (*neque* = and—not) spared (dat.) even the prince, who had insulted the majesty of the law. 4. But the prince, with wonderful greatness of soul, when he came to the throne, bestowed the highest honours on the judge (who had) appeared so upright (lit., touched with the highest honours the judge).

Note.—3. *Immo*, nay, rather; *vēro*, indeed, hardly needs translating.

Retranslation.—1. But she, hearing the design, was greatly alarmed; for her consort was dearer to her than her so cruel brother. 2. Therefore she hid her fear for the time, and taking the dagger (abl. abs.), promised to kill the king next day. 3. But as soon as she returned home, she laid the matter before the king, who, because the Arab had shown himself a freebooter rather than a prince, ordered his guards to kill both him and the other conspirators.

1. Hearing, &c., abl. abs., the design (*consĭlio-*, n.); being heard (*audīto-*); greatly alarmed, *perterrĭto- a-*; consort, *conjŭg-* (nom. usu. *conjunx*); dear, *cāro-*, comparat. *cārĭōr-*; to her, reflexive pron. *sĭbi*; than, *quam*; so, *tam*; cruel, *saevo.*

2. Hid, *cēla-*, pf. *cēlāvi*; for, *ad* + acc.; time, *tempŏr*, n.; taken, *capto-*; promise, *promitt-o*, *-mīsī*, constr. as 'hope,' Ex. xxi. 3; next, *postĕro-* (time when = abl.).

3. As soon as, *simŭl* (*atque* + pf.); return, *rĕdeo*, *redĭī*; lay before, *prōpōn-*, *-pōsu-ī*; show, *praebe-*, *-bu-ī*; freebooter, *lātrōn-* (Apposn. to *himself*); rather, *māgĭs*; order, *jūbe-*, *juss-ī*; kill, *interfĭcĕre*; him, do not use *sē* = the speaker; other = the rest; therefore, *cētĕrī*, not *ălĭī*; conspirator, *conjūrātōr*; both—and, *-ŭ—ŭ*.

Relative and Interrogative Pronouns.

Qui, who (rel.) is declined from a stem *quo-*, M.N., *qua-*, F., as follows:

	M.	F.	N.
Sing. N.	quī	que	quŏd
Acc.	quem	quam	
G.	cūjŭs	for all grades	
D.	cuī		
Abl.	quō	quā	quō
Pl. N.	quī	quae	quae
Acc.	quos	quās	
G.	quōrum	quārum	quōrum
D. Ab.	quĭbŭs (or quīs) for all grades		

The Interrogative *quis* only differs from *qui* relative in the Nom. Sing.; the indefinite *quis* in Nom. Sing. and neut. N. Acc. pl.

Interrog. *quis*, who?

N.	quis	(quis)	quĭd
	quī	quae	quŏd

Indef. Pronoun *quĭs*, any.

Sing. N.	quĭs	quă	quĭd
	quī	quae	quŏd
Pl.	quī	quae	quă
			quae

Note.—In both of these *uis* and *qĭs* compounds are used *chiefly* as substantives; *qui* and its compounds *chiefly* as adjectives; *quid* and its compounds *always* as substantives; *quod* and its compounds *always* as adjectives.

Quarterly Arithmetical Tests.

BY JOSEPH WOLLMAN,

Head Master of the Wellgate Board School, Rotherham.

Standard I.—First Quarter.

1.	2.	
6	645	4. It takes 847 slates to cover a school, 536 to cover a house, and 328 to a cover shed. How many does it take in all?
531	203	
19		
5	3. 198	
284	75	

Second Quarter.

1.	2.	
42	25	4. If I take 347 marbles from a bag containing 618, how many would be left?
7	432	
914		
5	3. 270	
28	3	

Third Quarter.

1.	2.	
309	483	4. A man owes 25 pounds to one person, 36 to another, and 47 to a third. He has owing to him 19 pounds from one person and 58 from another. How much is he in debt?
572	395	
185		
490	3. 101	
763	6	

Standard II.—First Quarter.

1. 3,520 + 1,095 + 20,604 + 19,078 + 5,006 + 8,467.

2. 98,765 × 35.

3. From 45,108 subtract 39,362.

4. Three boys went nutting, and they got 7,502. One boy got 2,046, and another 2,917. How many did the third boy get?

Second Quarter.

1. What is the product of 708 and 59,086?

2. Divide 42,054 by six, and write the answer in words.

3. Take 9,804 from 50,060.

4. George has 78 marbles, and William has 30 times as many. How many have they together?

Third Quarter.

1. Find the difference between 29,708 and 30,650.

2. What is the eleventh part of 96,415?

3. 85,704 × 9,006.

4. A farmer bought 68 cows at 17 pounds each, and 19 sheep for 72 pounds. How many pounds did he spend altogether?

Standard III.—First Quarter.

1. Divide 305,019 by 46.

2. 568,729 × 6,580.

3. How many times is 188 contained in 759,144?

4. A piece of cloth was 200 yards in length. There were cut from it 7 pieces each 9 yards long, 5 pieces each 11 yards long, and 8 pieces each 6 yards long. How many yards remained?

Second Quarter.

1. What is the sum of £854 15s. 7½d., £201 13s. 11¼d., £739 16s. 5½d., £478 19s. 8¾d., and £690 10s. 4½d.?

2. How many hours would it take a train to travel two journeys of 789 miles and 821 miles at the rate of 35 miles an hour?

3. Subtract £853 0s. 6¼d. from £3,490 7s. 3¾d.

4. A farmer paid £150 for rent, £35 16s. 8d. for seed, and £108 17s. 6d. for wages. He sold the produce of his fields for £520 10s. What did he gain?

Third Quarter.

1. What must be added to £94 17s. 11½d. to make £6,003 13s. 6d.?

2. There are 1,760 yards in a mile. If a postman takes one yard each step, and walks 16 miles a day, how many steps does he take in a fortnight?

3. £76 18s. 4½d. + £6,093 7s. 11½d. + £8 6s. 9¾d. + £407,600 15s. 10¼d. + £13 14s. 5d.

4. What should be paid for four books, when the first cost 3s. 9d., the second 10d. less than the first, the third 8d. more than the second, and the fourth 1s. 3d. less than the third?

Standard IV.—First Quarter.

1. Multiply £96 11s. 0¾d. by 3,005.

2. Divide £342,313 10s. 1½d. by 503.

3. A person gave a five pound note to pay for his lodgings during the month of July, at 2s. 9d. a day; what change should he receive?

4. Find the sum of 13 guineas, 9 half-crowns, 25 sixpences, 54 shillings, and 27 pence.

Second Quarter.

1. How many more farthings are there in a thousand guineas than a thousand pounds?

2. How often is 13 tons 13 cwt. 13 lbs. contained in 1,474 tons 16 cwt. 2 qrs. 4 lbs.?

3. How many miles would 759 pieces of cloth reach, each piece being 160 yards in length?

4. A has 35 pounds of tea worth 3s. 4d. per pound, and he exchanges it with B for sugar at 3½d. per pound; how many pounds of sugar must B give A?

Third Quarter.

1. Reduce 925,340 hours to years, days, and hours.

2. If 25 qrs. 6 bus. 2 pks. be bought for £68 16s. 8d., what is the price per quart?

3. Bring 76 acres 19 sq. pls. 7 sq. ft. to square inches.

4. The hind wheel of a carriage is 13 feet in circumference, and the fore wheel is 10 feet; how many revolutions will one make more than the other in 6½ miles?

Standard V.—First Quarter.

1. What is the value of 19 sq. yds. 5 sq. ft. 104 sq. in. at 13s. 6d. per sq. yard?

2. Find the cost of 8,102⅔ tons at 14s. 8¼d. per ton.

3. How much is three hundred and fifty thousand and seventy-eight times twenty-nine and a half guineas?

4. What would be the cost for 26 miles 2 fur. 206 yds. at £5 10s. per mile?

Second Quarter.

1. If 101 acres of land yielded 334 qrs. 4 bus. 2 pks., how much was got from 52 acres of it?

2. If, when malt costs 63s. a quarter, the price of a quart of ale is 4½d., what should be its price when malt is at 66s. a quarter?

3. Find the cost of 53 cwt. 3 qrs. 11 lbs. at £7 18s. 8d. for 4 cwt.

4. How much change should you get out of a £10 note after paying the following bill:—

56 table-books at 4 for 6d.;
8 dozen geographies at 2½d. each;
3,750 slate pencils at 9s. 6d. per 1,000;
72 rulers at 1s. 4½d. per dozen;
26 atlases at 4s. 3d. each.

Third Quarter.

1. What must be added to the sum of $\frac{3}{10}$ and $\frac{5}{11}$ to make $\frac{1}{2}$?

2. If 27 men can perform a piece of work in 15 days, how many men must be added to the number that the work may be finished in three-fifths of the time?

3. Simplify $(\frac{3}{5} + \frac{3}{7}) - (\frac{1}{4} + \frac{4}{5})$.

4. How many oranges at 3 for 2d. should be given in exchange for 9 lbs. of butter at 1s. 3d. per lb., and 7½ lbs. of cheese at 10d. per lb?

Standard VI.—First Quarter.

1. Find the result to four places of decimals of $(\cdot0076 \times 674\cdot59) \div \cdot0958$.

2. Simplify $\dfrac{(3\frac{3}{4} + 4\frac{1}{2}) \div 5\frac{5}{6}}{(2\frac{1}{2} - 1\frac{5}{8}) \text{ of } 3\frac{1}{3}}$.

3. A tailor had 560 yards of cloth. He used ·375 of it, and then ·64 of the remainder. How much had he left?

4. Multiply ·07$\dot{4}$ by ·$\dot{3}\dot{5}$, and give the product as a decimal to six places.

Second Quarter.

1. A farmer sold five lots of rye, each containing 34 bus. 2½ pks., for £40 7s. 11d. How much ought 100 qrs. of the same rye to fetch at that rate?

2. Reduce 5½ chains to the decimal of 3¾ miles.

3. A grocer bought a ton of tea for £168, and sold it at 1s. 9d. a lb. How much did he gain on every sovereign of his outlay?

4. Express ·02$\dot{5}\dot{9}$ of a year in days, &c.

Third Quarter.

1. What is the interest on £93 15s. for ⅓ year at 3½ per cent.?

2. A can do half a piece of work in 5 days, and B can do a third of it in 4 days. How long would it take them to do the whole working together?

3. If £720 was placed in a bank at 3 per cent., and £790 4s. was withdrawn, how long was it deposited?

4. A man left ·6 of his money to his eldest son, ·25 to his second son, and the remainder, which was £480, to his daughter. What was the second son's share?

STANDARD VII.—FIRST QUARTER.

1. The average rainfall in a week was 2·74 inches. The rainfall on Sunday was 3·18 inches, and on Monday it was 1·09 inches. What was the average for the remainder of the week?

2. At what rate per cent. will £260 amount to £282 15s. in 2 years 4 months?

3. A joiner earning 7½d. per hour worked in a week 9, 8½, 10, 9¾, 10¼, and 5½ hours. What was his average daily wages?

4. In a city of 240,000 inhabitants there was an average weekly death-rate of 126. What was the average number of deaths per annum per thousand of the population?

SECOND QUARTER.

1. If a grocer by selling tea at 2s. 2d. a lb. gain 30 per cent., what did he buy it at per cwt.?

2. Three men hold a farm in common; one pays £97, another £79, and the third £100, as their shares of the rent. A rate of £34 10s. is levied on the farm; what is each man's portion?

3. If I buy coal at 12s. 6d. per ton, and sell it at a gain of 26 per cent., what quantity must I sell to gain £12 13s. 6d.?

4. What sum will amount to £685 12s. 8d. in $\frac{2}{3}$ year at 3½ per cent.?

THIRD QUARTER.

1. If a broker buys at 10 per cent. discount, and sells at 10 per cent. premium, what is his gain per cent?

2. What income shall I derive from investing £29,400 in bank shares at 245, paying 17½ per cent.?

3. A person sold a house for £2,478 more than it cost him, and gained 35 per cent. What did he give for it?

4. I had £900 stock in the 4 per cents. at 105, and transferred it to the 3 per cents at 75. What was the increase in my income?

ANSWERS.

STANDARD I.

FIRST.	SECOND.	THIRD.
1. 845.	996.	2,319.
2. 442.	293.	88.
3. 123.	267.	95.
4. 1,711 slates.	271 marbles.	31 pounds.

STANDARD II.

FIRST.	SECOND.	THIRD.
1. 57,770.	41,832,888.	942.
2. 3,456,775.	7,009.	8,765.
3. 5,746.	40,256.	771,850,224.
4. 2,539 nuts.	2,418 marbles.	1,228 pounds.

STANDARD III.

FIRST.	SECOND.	THIRD.
1. 6,630+39.	£2,965 16s. 1¾d.	£5,908 15s. 6½d.
2. 3,742,236,820.	46 hours.	394,240 steps.
3. 4,038 times.	£2,637 6s. 9½d.	£413,793 3s. 4¾d.
4. 34 yards.	£225 15s. 10d.	12s. 7d.

STANDARD IV.

FIRST.	SECOND.
1. £290,142 2s. 9¾d.	48,000 farthings.
2. £680 10s. 10½d.	108 times.
3. 14s. 9d.	69 miles.
4. £18 4s. 3d.	400 pounds.

THIRD.

1. 105 yrs. 230 dys. 20 hrs.
2. 2½d.
3. 477,466,524 sq. in.
4. 792 revolutions.

STANDARD V.—FIRST.

1. £13 5s. 1d.
2. £5,950 7s. 11d.
3. £10,843,666 1s.
4. £145 0s. 4½d.

SECOND.

1. 172 qrs. 2 bus.
2. 4¾d.
3. £106 15s. 11¾d.
4. 7s.+£1+£1 15s. 7½d.+8s. 3d.+£5 10s. 6d.=£9 1s. 4½d.
   £10−£9 1s. 4½d.=18s. 7½d.

THIRD.

1. $\frac{107}{880}$.
2. 18 men.
3. $\frac{81}{112}$.
4. 315 oranges.

STANDARD VI.

FIRST.	SECOND.	THIRD.
1. 53·5165+	£186 13s. 4d.	£1 1s. 10½d.
2. $\frac{39}{8113}$.	·0190972.	$5\frac{4}{11}$ days.
3. 126 yards.	3s. 4d.	3½ years.
4. ·026318+	9 days 11 hrs. 6 min. 40 sec.	£800.

STANDARD VII.

FIRST.	SECOND.	THIRD.
1. 2·982 inches.	£9 6s. 8d.	22⅔ per cent.
2. 3¾ per cent.	£12 2s. 6d.; £9 17s. 6d.; £12 10s.	£2,100.
3. 5s. 6¼d.	78 tons.	£7,080.
4. 27·3.	£670.	£1 16s.

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A. C. DIXON, M.A., *Senior Wrangler, Fellow of Trinity College, Cambridge,*

AND

GEORGE BEACH, M.A., LL.D., *Head Master of the Higher Grade School, Macclesfield.*

DIXON and BEACH'S **GIRLS' ARITHMETIC** exactly meets in all respects the requirements of the New Circular (No. 297), issued February, 1891, by the Education Department.

[EXTRACT.]

Memorandum on the Training and Instruction of Pupil Teachers.

ARITHMETIC.

'The papers prepared by the Pupil-Teachers at the periodical examinations show that the teaching of Arithmetic leaves much to be desired. The arithmetical exercises have been too often limited to the working out of "sums,' and have failed to **exercise the reason of the learners in connexion with the meaning and the theory of the rules employed.** More attention will now be needed to this important part of the teachers' training. In the "Instructions to Inspectors" (paragraph 25), those officers are enjoined "to ask the teacher of the class to give a demonstrative lesson." And it is added that **"he should so work out an example on the black-board as to make the reason for every step in the process intelligible and interesting to the scholars."** It is manifest that this requirement cannot be fulfilled in schools in which the Pupil-Teacher in his time of study is simply told to sit down and work exercises, **and** is not helped and guided by his teacher to a right **understanding of arithmetical principles.'**

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Needlework for Pupil-Teachers.

BY MISS SOPHY LOCH,

Examiner of Needlework to the London School Board.

WORK FOR THE FOURTH STANDARD.

HAVING now gone through the various points to be noted in cutting-out and putting together a simple chemise suitable for a First Year Pupil-Teacher, we will now pass on to the nightshirt, and suppose that this garment has been chosen as the one to be shown to H. M. I. The nightshirt includes all the stitches required, except tucking; a sample of tuckings should therefore be worked on a separate piece of material and be tacked on to the shirt, so as to indicate to H. M. I. that it has been included by the Pupil-Teacher in her curriculum of work during the year.

The same remarks apply to the choosing of pattern and material as were made in the case of the chemise; the cloth chosen for the nightshirts must, however, be somewhat stouter in make than that used for chemises. The cotton and needles must be suitable to the material. The pattern and calico being chosen, and the amount of material required to make one or several garments having been carefully calculated, the next step will be to measure very accurately and tear off the front and back breadths, allowing for turnings if they are not included in the pattern. These breadths must be of course pulled quite straight before they are made up. One of the usual ways of making up men's or boys' nightshirts is with a yoke at the back only; this pattern both looks and wears well. Supposing, then, a yoke to be required, this is the next part which has to be carefully cut out, then the collar, wrist-bands, false hems, binders, and piece of calico for the hip gussets must be torn off. These have all, including the yoke, to run the self-edge way of the cloth, the yoke being double. The sleeves will come out of a piece of calico the same breadth as the body of the shirt, the length, of course, varying according to the pattern. Shirts are always made with the back somewhat longer than the front; in the case of a yoke being required at the back only, the front and back breadths must be torn off the same size, as the required extra length for the back breadth will be given by the yoke.

The shirt being now so far cut out, its different parts are worked in the following order:—

1. Tack carefully round the double yoke, not too close to the edge, so as to keep the raw edges perfectly even.

2. Place the front and back breadths together (making due allowance for the yoke at the back), fix and work the side seams. Points to be noted are—requisite lengths must be left for the armhole and the bottom slit; the seams must fall to the front, and the fells to the back.

3. The binders (four in number) must now be prepared and placed round the armholes.

1. 2. 3. Edge turned in once, and hemmed on to garment.

4. Where the two binders are joined together on the inside by running and back-stitching.

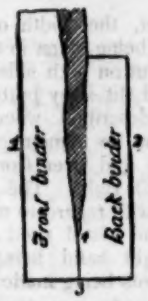


Fig. 25.

They should be carried some distance below the bottom of armhole as shown in Fig. 25. This gives greater strength. One binder will be cut shorter than the other, as none is of course needed under the yoke. The shaded part of the diagram represents the the armhole, and the raw edge of the binder meets the raw edge of the armhole.

4. The yoke must now be fixed. The turnings must be perfectly straight. The back breadth must be gathered and put into the yoke, which is often improved by being previously stitched. The front part of the yoke must be arranged and worked first, and then the back. The gathers should not extend across the back from binder to binder, but a suitable distance be left plain on each side. Both that part of the back breadth which is to be gathered and the part of the yoke into which it is to be put must be previously halved and quartered to ensure the gathers being evenly distributed.

5. The front slit must now be torn down the required length. The slit should be long enough to allow the collar to lie *quite flat*, when the shirt is being ironed. There are various ways of treating this front slit; one way is to take the slit exactly down the centre of the garment and hem it on both sides with a suitable sized hem. The left side must fold over the right, and the right side would have to be cut a little at the bottom of the slit to make the material lie flat. A piece of calico cut self-edge way, termed a 'placing' must be stitched previously and then hemmed on at the bottom of the slit to make the latter look neat. A similar 'placing' will be hemmed on the wrong side to correspond.

1. 2 Rows of stitching.
2. 'Placing.'

Fig. 26.

Should, however, the width of the garment not allow of the hems being taken in the materal itself, a false hem can be put on both sides. Another way of managing this front slit is by putting on a front piece in the manner described when speaking of the chemise. It must be remembered, however, that women's garments fold over from right to left, and men's from left to right. The reason alleged by some for this rule with regard to men's clothes, is that in former days the pistol used to be kept in the bosom, and the right hand being, of course, used necessitated garments being made in this fashion.

6. The shoulders of the front breadth must now be sloped to match the shoulders of the yoke, and the latter carefully turned in once. This requires much care, that the material may not be unduly stretched. The front shoulders must now be inserted into the yoke shoulders, tacked and stitched on on the right side, and then tacked and hemmed on the wrong side. The hemming stitches must not be allowed to show on the right side. It must be remembered, both in putting on the yoke and in putting the shoulders together, that near the armhole a little open space must be left to allow the sleeve to be properly inserted.

(To be continued.)

The 1891 Scholarship Examination.

BY DR. GEORGE BEACH, M.A.

Co-Author of 'A Manual of our Mother-Tongue,' Author of 'Elements of English,' 'Entertaining Readers.'

1. As will be seen below, we resume this week both our Routines and Examination questions.

2. NOTES ON NEWFOUNDLAND.

Newfoundland was discovered by the Northmen, about the year 1000 A.D., and re-discovered by John Cabot in 1497, on which occasion he took formal possession in the name of England. A settlement was, however, subsequently formed by some Portuguese adventurers who were expelled by Sir Francis Drake.

After this period numerous English Colonies were established from time to time along the south, in the Bay of Placentia. But in 1713, by the treaty of Utrecht, Newfoundland and its dependencies were secured to the British, the French, however, being unfortunately allowed to retain the coasts from Bonavista to Cape Riche for fishing and curing stations.

These short-sighted concessions have frequently involved England and France in a most unpleasant manner, and, most marvellously, the many opportunities afforded during the last 180 years of extinguishing the French privilege have not been taken advantage of. Nay, further, by the Treaty of Paris the Isles of S. Pierre and Miquelon, off the south-west coast, were ceded to France.

At the present time now that the lobster (which is not mentioned in the Treaty of Utrecht) and the minerals upon the French shore have immensely increased in relative importance, the vital interests of Newfoundland are seriously threatened by the stringently exacted exercise of these alien rights.

In fact France, hating our presence in Egypt, is making her treaty-given powers most unpleasantly felt in Newfoundland, in order to compel us, indirectly, to retire from the land of the Pharaohs.

Great Britain, however, although incurring immense unpopularity in Newfoundland, is forcing that island to respect the sacred rights of treaties, and is endeavouring to negotiate a favourable settlement with France, and has submitted the disputed points to arbitration.

Should the latter country, however, obstinately refuse any equitable arrangements, it is to be borne in mind that International Law itself expressly allows that the whole of the duties of States is subordinated to the right of self-preservation, and it forbids no Act (however extreme) consistent with the nature of a moral being, so soon as it can be proved that by it, and it only, self-preservation can be secured.

A case illustrative of this rule is afforded by a recent dispute between Great Britain and the United States. By the Treaty of Washington of 1871 it was provided that the inhabitants of the United States should have liberty in common with the subjects of Great Britain to take fish upon the Atlantic coasts of British North America. Subsequently to the conclusion of the Treaty, the Legislature of Newfoundland passed laws with the object of preserving the fish off the shores of the colony (this preservation being a work of the first necessity as regards the self-preservation of the colony's prosperity); a close time was instituted, a minimum size of mesh was prescribed for nets, and a certain mode of using the same was prohibited. These regulations were disregarded by fishermen of the United States; disturbances ocurred between them and the colonial fishermen; and the matter became a subject of diplomatic correspondence, in the course of which the scope of the Treaty came under discussion. It was at last decided, that no more could be demanded under the exigency of such cicumstances than that American citizens should not be subject to laws or regulations either affecting them alone or enacted for the purpose of putting them at a disadvantage.

3. Some of our pupils appear to be puzzled by the fact that in 'Division of Fractions' the Quotient may sometimes be larger than the Dividend. Now, whether the fractional Divisor be a Vulgar or Decimal Fraction matters not, the Principle is the same.

If Division be looked upon (as it may be) as a kind of Reduction, all difficulty disappears. When dividing 1,000 by ten, we may consider that we are reducing 1,000 to tens. This is a good illustration, for if we regard the Dividend as ONE thousand, we can also imagine the Quotient as ONE HUNDRED units, and it is therefore 100 times larger than the Dividend. *Imagine therefore the Divisor as the Unit*; if it be one, the Quotient will equal the Dividend, if it be more than one, the Quotient will be less than the Dividend; if it be less than one, the Quotient will be more than the Dividend.

OR AGAIN, if we remember that the product of the Quotient and Divisor equals the dividend, then it is quite plain that

$$\text{Quotient} = \frac{\text{Dividend}}{\text{Divisor}} \text{ or } \frac{Q}{\text{Dividend}} = \frac{1}{\text{Divisor}}.$$

From this equation it is easy to see that where *unity* is more than the Divisor the Quotient will be more than the Dividend.

4. SUM 4, p. 156.—There are several ways of solving this problem, but the *neatest* one is that which utilises these two formulæ:—

Discount = Interest of Present Worth, and

Discount = Principal *minus* Present Worth.

'*The true discount on a sum due 18 months hence at 4 p.c. per annum is £22 0s. 3d. What is the sum?*'

The Discount for 1 year = $\frac{2}{3}$ of £220 3s. = £14 13s. 6d.

∴ £14 13s. 6d. = Interest of Present Worth at 4 p.c.

∴ £14 13s. 6d. × $\frac{100}{4}$ = Present Worth.

∴ £366 17s. 6d. = Present Worth.

∴ £366 17s. 6d. + £22 0s. 3d. = Present Worth + Discount.

∴ £388 17s. 9d. = Principal. Q.E.D.

5. EUCLID DEDUCTIONS (*Egan*):—

The following are important and probable ones—13, 20, 24, 25, 31, 32, 36, 40, 42, 50, 51, 52, 59, 60, 68, 70, 74, 82, 83, 92, 96, 102, 103, 105, 107, 110, 115, 118, 119, 121, 122, 124, 135, 137, 147, 149, 150, 156, 163, 165, 166, 167, 206, 214, 220, 313, 314, 315, 316, 317, 320, 321, 324, 326, 328, 330, 334, 340, 341, 343, 345, 346, 352, 359.

If the above sixty-four deductions are mastered, the candidate need not fear being unable to solve the scholarship ones; for these latter will, in all probability, be either one of the above, or dependent upon or akin to them.

6. HISTORY:—

It is almost certain that the great bulk of this paper will relate to the period 1688—1891, but a few questions will be set upon previous years' work. It must not be forgotten, that the Scholarship Examination, being substituted for the Fourth Year Examination, is intended as well for those about to desert the profession, as for those persevering therein. Similar remarks apply to Geography.

WEEK COMMENCING 20TH APRIL, 1891.

DAYS.	FIRST HOUR.	SECOND HOUR.	THIRD HOUR.
M.	Algebraic Factors, *or* Questions on Needlework.	From A.D. 1688 to A.D. 1702.	Latin (see Mr. Huxley's Articles), *or* French (see Article).
TU.	Euclid's Definitions, &c., to I. 5, *or* Calico Sampler.	General Map of the United States.	Science.
W.	Proofs and explanations of ordinary operations with Money.	Drawing.	Composition and History of English.
TH.	Simple Equations, *or* Savings and Investments.	From A.D. 1702 to A.D. 1715.	Latin (see Mr. Huxley's Articles), *or* French (see Article).
F.	Euclid I. 6 to I. 20, *or* Calico Sampler.	Geography of United States.	Science.
S.	Mensuration of Rectangles, *or* Fractions.	Revise History, Roman Period.	How to teach Reading.	Paraphrasing and Table of English Literature.

REMARKS ON ROUTINE.

(1) Except in the case of languages, the lower half of the rectangle prescribes the ladies' work, when it differs from that of the sterner sex.

(2) Two copies of about six lines each should be written every week, one of large, and the other of small hand.

(3) The services of a friend should be utilised in order to give out the dictation.

(4) FACTORS (*Algebra*).

Hamblin Smith—Examples XVII. to XXVII., pp. 43 to 51, sums 7 and 8 in all; *or*,

Charles Smith—Examples XXII. to XXVIII., pp. 93 to 105, sums 10, 11, and 12, in all; *or*,

Todhunter—Example XV., pp. 74, 75, sums 23 to 40.

SIMPLE EQUATIONS.

Hamblin Smith, Example XXXII. p. 60, sums 4, 7, 10 up to 28; and Example XXXIII. p. 62, sums 11, 15, 19 up to 39, *or*

Charles Smith, Example XVI., p. 62, sums 11, 16, 21 up to 51, and Example XVII. p. 67, sums 11, 16, 21 up to 51, *or*

Todhunter, Example XIX., p. 99, sums 16, 26, 36 up to 66; and Example XX., p. 108, sums 14, 24, 34 up to 64, and Example XXI. p. 116, sums 17, 25, 33 up to 41.

(5) EUCLID.

Deighton.—(*a*) pp. 1 to 17 and (*b*) pp. 17 to 34. (*Scotch Code*, pp.).

Todhunter.—(*a*) pp. 1 to 11 and (*b*) pp. 12 to 23. (*Scotch Code*, pp.).

(6) MENSURATION (*Todhunter*).

(7) ARITHMETIC.

GENTLEMEN, *Pendlebury.*—Read up pp. 50, 51, 58, 59, 62, 64, 68, 69.

LADIES, *Dixon and Beach.*—(*a*), read up pp. 14 to 23, 29, 35, 36, 37, 39, and (*b*) read up pp. 77 to 81, 90 and 91, and work sums 6, 23, 39 and 41 of Example XV.

(8) HISTORY.

Sanderson.—(*a*) pp. 268 to 279, and (*b*) pp. 279 to 295. (*Scotch Code*, The Angevin or Plantagenet Dynasty.) (*c*) pp. 13 to 22.

Ross.—(*a*) pp. 315 to 331, and (*b*) pp. 331 to 346. (*Scotch Code*, Wars of the Roses.) (*c*) pp. 1 to 16.

(9) ENGLISH (*a*) COMPOSITION.

Write an essay (from 16 to 20 lines long) upon (I.) '*A walk round a garden*,' or II. '*The advantages of a School Library for children*.'

(*b*) PARAPHRASING.

'Milton! thou shouldst be living at this hour,
England hath need of thee. She is a fen
Of stagnant waters; altar, sword, and pen,
Fireside, the heroic wealth of hall and bower,
Have forfeited their ancient English dower
Of inward happiness. We are selfish men.
Oh! raise us up: return to us again,
And give us manners, virtue, freedom, power.
Thy soul was like a star, and dwelt apart;
Thou hadst a voice whose sound was like the sea;
Pure as the naked heavens, majestic, free,
So didst thou travel on life's common way,
In cheerful godliness; and yet thy heart
The lowliest duties on herself did lay.

(10) FRENCH.

Professor Darquet's Elementary French Course, pp. 91 to 106 and '*La Jeune Sibérienne*' pp. 36 to 46.

LATIN.

Read *Mr. Huxley's Article* and chapters 25 to 34 of '*De Bello Gallico*.'

(11) NEEDLEWORK (*Ladies*).

Describe the different methods of darning and the purposes of the stitch, naming the garments and materials on which it is generally used.

(12) SAVINGS AND INVESTMENTS (*Ladies*).

Hughes's Domestic Economy, pp. 413 to 423.

SELECTED GOVERNMENT QUESTIONS.

1. Show that the L.C.M. of two Algebraical expressions is their product divided by their G.C.M.

Find the G.C.M. and L.C.M. of $6a^3 - 5a^2x - 6ax^2$
$4a^2x - 12a^2x^2 + 9ax^3$ and
$6a^3x - 13ax^3 + 6x^4$.

Ans. $2a - 3x$; $3ax\,(9a^2 - 4x^2)\,(2a - 3x)^2$.

2. Prove that $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ where the letters denote any numbers.

Simplify $\frac{3x - 4y}{4x + 5y} - \frac{4x - 5y}{5x + 6y} + \frac{1}{20}$.

Ans. $\frac{9xy + 50y^2}{20\,(4x + 5y)\,(5x + 6y)}$

3. If two triangles have two sides of the one equal to two sides of the other, each to each, and have likewise the angles contained yb these sides equal to one another, they shall be equal in every respect.

ABCD is a square, ABE an equilateral triangle. If EC, ED be drawn, the triangle DEC is isosceles.

4. The area of a circle is 38·5 feet. Find the side of a square whose perimeter is equal to the circumference of the circle ($\pi = \frac{22}{7}$). Ans. $5\frac{1}{2}$ feet

5. A man laid out £14 5s. 9d. on gloves at 2s. 3d. per pair. Some of them faded, the rest he sold for £18 11s. 3d. at 3s. $4\frac{1}{2}$d. the pair. How many pairs faded? Ans. 17 pairs.

6. What income is derived from the investment of £188,497 in the $2\frac{1}{2}$ per cents. at $101\frac{1}{2}$ (Brokerage not to be reckoned)? Ans. £5,126.

7. Subtract £1,094 18s. $11\frac{1}{4}$d. from £2,502 5s. and explain (as to a class) each step taken. Ans. £1,407 6s. $0\frac{3}{4}$d.

8. In whose reigns did Addison, Smollett, Cowper, Adam Smith, Burns, and 'George Elliot,' live? Mention the writings of any two of them.

9. Write a short life of Lord Nelson *or* Lord Macaulay.

10. Mention the chief islands of the West Indies, giving the nations who possess them.

11. What are the chief countries of South America? Give their capitals and one river in each.

12. Analyse

Our bugles sang *truce*, *for* the night cloud had lowered,
And the sentinel stars set their watch in the sky,
And thousands *had* sunk on the ground *overpowered*,
The *weary* to sleep, and the wounded *to die*.

13. Parse the italicised words of question 12.

14. Write full notes of a lesson on Adverbs and Adverbial phrases *or* (*for Infants*) on the square and its properties (either by paper-folding or drawing).

15. (*Ladies*) Compare the relative advantages, as regards salary, to a schoolmistress, of

(*a*) A country school, with a teacher's house and £60 per year, and

(*b*) A town school, without a house, and £90 per year.

16. Write in LARGEHAND, as a specimen of Penmanship, the word *Presbyterian*.

Write in SMALLHAND—

'*Lives of great men all remind us*
We can make our lives sublime.'

17. DICTATION.

Those who look | on his character | without favour | or malevolence | will pronounce that, | in the two great elements | of social virtue, | in respect for the rights of others, | and in sympathy | for the sufferings of others, | he was deficient. | His principles | were somewhat lax; | his heart was somewhat hard. |

But though we cannot with truth | describe him | either as a righteous | or a merciful ruler, | we cannot regard | without admiration | the amplitude and fertility | of his intellect, | his rare talents for command, | for administration, | and for controversy, | his dauntless courage, | his honourable poverty, | his fervent zeal | for the interests of the State, | his noble equanimity, | tried by both extremes | of fortune | and never disturbed | by either. |

CORRESPONDENCE.

C. G. (Napchisber Villas, Ash Road.)—Am much gratified with the news, and answered your note by return, but my letter was sent back by P.O. officials.

H. J. (Llanybyther.)—See present Article.

RIDLEY.—A very difficult passage. *What* subject, *became* predicate, *of George Stephenson* extension of predicate. Compare *What transpired about the South Sea Bubble?*

When you cannot do *as* you like, the *best* is to like *what* you have *to do*.

KIND OF SENT.	SUBJECT.	PREDICATE.	OBJECT.
(*a*) Princ.	The best	is to like what you have to do	
(*b*) Noun after *like*	you	have	to do what
(*c*) Adv. to (*a*)	(when) you	cannot	[to] do as you like
(*d*) ,, ,, (*c*)	you	like	[to do]

as—Connect. adv., joins two sentences and mod. *do*.

best—Adj. used as a noun, sing., 3rd, neut., nom. case, subject to *is*.

what—Indefinite pron., sing., 3rd, neut., obj. case, gov. by *to do*. It is unscientific to split up *what* into *that which*.

(To be continued.)

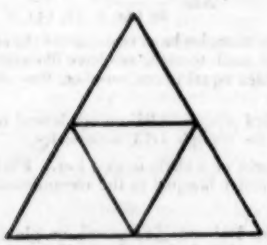
Teachers' Notes of Drawing Lessons for Standard III.*

By an Art Teacher under the London School Board.

TRIANGLES.

An *Equilateral* triangle has its three sides equal.
An *Isosceles* triangle has two sides equal.
A *Right-angled* triangle must have a right-angle, but its sides may be of any length.

EQUILATERAL.



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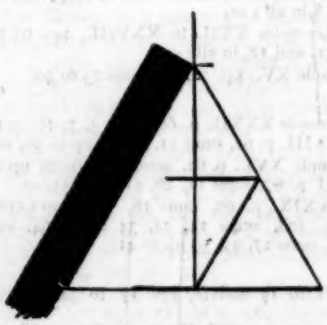


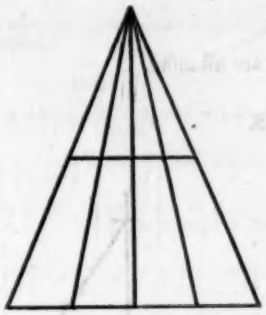
13. Work.

Draw the bottom line, which is called the BASE, and mark its length on the ruler. Mark the middle of the base, and with the square draw up a perpendicular. From the bottom of the triangle to the top, or APEX, will be shorter than the length of the base, while the side has to be the same length as the base.

* The Teaching of Drawing becomes compulsory on September 1st, 1891. These articles will be specially helpful to teachers who know but little of the subject. They will teach them how to teach it successfully.

Place the ruler with the length marked on it so that the mark is touching one end of the base and the corner of the ruler touching the upright line. That shows where the apex must be. Put a mark there and draw the two sides. Mark the middle of each side and draw the inside triangle.

ISOSCELES.



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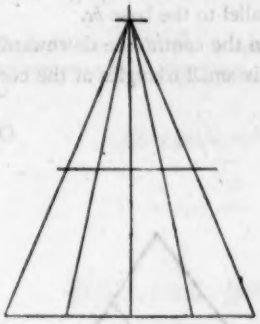
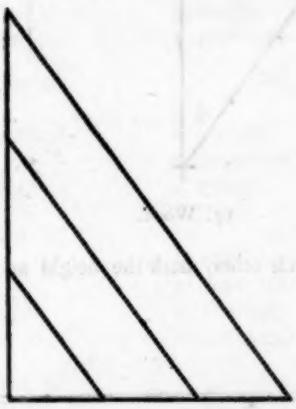


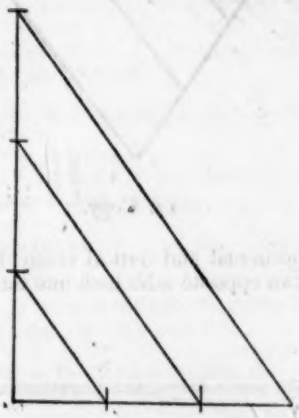
14. Work.

Mark the middle line the same height as the copy; draw the sides and mark the middle of each; divide the base into four equal parts.

RIGHT-ANGLED.



15. Copy.

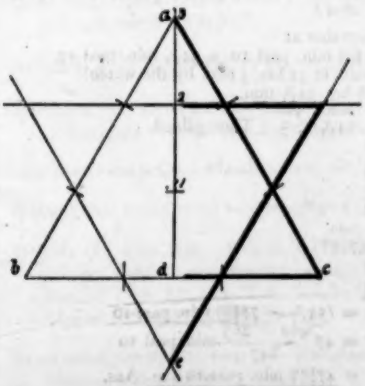


15. Work.

Draw the base the same length as in the copy, and a perpendicular at one end the same height as the copy. Divide each of these two lines into three equal parts, then the long side and the two inside lines will be parallel.

Work 13, 14, 15 upside down, and 15 with the long side to the left.

16. Copy.



16. Work.

Draw first the equilateral triangle *abc* as directed in Exercise 13.

Divide each of the three sides into three equal parts, very carefully.

Through these divisions draw lines which cross each other to form the second triangle, taking care that each line so drawn is parallel to one of the sides of the first triangle.

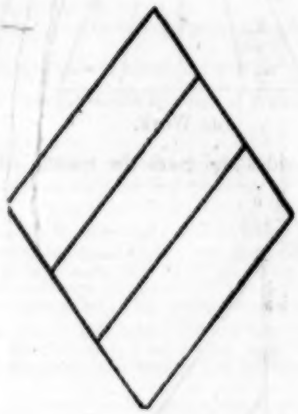
Another way :—Divide the upright line *da* into three equal parts, and through the second mark draw a line equal and parallel to the base *bc*.

Then lengthen the centre line downward, one division to *e*.

Look at the six small triangles at the corners to see if they are all alike.

OTHER FIGURES.

RHOMBUS.



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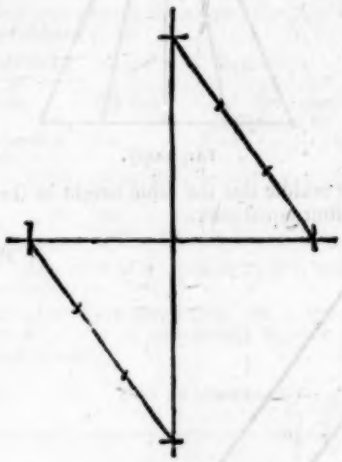

17. Work.

Draw horizontal and vertical centre lines perpendicular to each other, mark the height and the width, and divide two opposite sides each into three equal parts.

(To be continued.)

Query Column.

Arithmetic.

1. WATCHMAKER.—A watch is set right at noon, and at 8.0 p.m. the next day it is 5 min. too fast; what will be the correct time when its hands are together between 10 a.m. and 11.0 a.m. the day after?

Hands will be together at
$(50 + \frac{5}{11}$ of $50)$ min. past 10 $= 54\frac{6}{11}$ min. past 10.
Watch gains 5 min. in 32 hrs. 5 min. by the watch.
Total time = 46 hrs. $54\frac{6}{11}$ min.

hrs.	min.	hrs.	min.	min.
∴ 32	5	: 46	$54\frac{6}{11}$	:: 5 : Time gained.

60 60
1925 2814
11 11
21175 30954
4335 min.

847)6192($7\frac{443}{847}$
5929
263

∴ Correct time = $(54\frac{6}{11} - 7\frac{443}{847})$ min. past 10
$= 47\frac{462 - 263}{847}$ min. past 10
$= \underline{47\frac{199}{847}}$ min. past 10 a.m. Ans.

2. WILSON.—What is the least number by which 2,016 must be multiplied to become a perfect cube? What will the cube root be? By what must the cube of 728 be multiplied to become a perfect square?

What will the square root be?

(1) 2016
$= 8 \times 252$
$= 8 \times 4 \times 63$
$= 8 \times 4 \times 9 \times 7$
$= 2^3 \times 2^2 \times 3^2 \times 7$;
∴ Least number $= 2 \times 3 \times 7^2$
$= 294$.
Cube root $= 2 \times 2 \times 3 \times 7$
$= \underline{84}$.

(2) 728^2
$= (8 \times 91)^2$
$= 8^2 \times 91^2$
$= 4^3 \times 2^2 \times 91^2$;
∴ Least number $= 2 \times 91$
$= 182$.
Square root $= 2^3 \times 2^2 \times 91^2$
$= \underline{264,992}$.

No. 7.

1. A cistern is filled by one tap in 25 minutes and emptied by another in 30 minutes. If both are turned on together in what time will it be full?

2. Find the average of 18, 4½, 21, 0, 72 and 11½.

3. In what time will £1,050 amount to £2,100 at 5 per cent. simple interest?

4. What does one thousand guineas amount to in 3¼ years at 2¾ per cent. simple interest?

No. 8.

1. Find the simple interest on £450 for 1¼ years at 2½ per cent.

2. A man bought a house for £150 and sold it for £210. What was the gain per cent.?

3. A bell weighing 3 cwt. is composed of brass and copper in the proportion of 4 : 5. What per centage of each is there in the bell?

4. What interest would £950 gain in 15 months if £1,440 gain £60 in 10 months?

ANSWERS.

No. 1.	No. 2.
1. 36 days.	1. £205 16s.
2. ·00994318.	2. ·307692 and ·4285714.
3. = ½.	3. 1s. 7½d.
4. £586 2s. 6d.	4. 40 per cent.

No. 3.	No. 4.
1. $\frac{444}{1000}$.	1. ⅓.
2. ·36; ·15789; $\frac{3}{19}$.	2. 55½ horses.
3. £4¼.	3. ·571428 and 1·5.
4. $2\frac{4}{15}$ days.	4. $4\frac{11}{18}$ days.

No. 5.	No. 6.
1. ·037.	1. £226 16s.
2. £1 17s.	2. ·29411 and ·120$3\dot{7}$.
3. 22 and 55.	3. 3s. 5·013d.
4. £10 10s.	4. £38 and £19.

No. 7.	No. 8.
1. £10 $14\frac{3}{4}$s.	1. £13 2s. 6d.
2. ·30952.	2. £17 5s.
3. $1\frac{1}{11}$.	3. ·9583 and ·846153.
4. $\frac{1}{11}$ of 21s. by 4s. 6d.	4. 15½.

No. 1.	No. 2.
1. 5 per cent.	1. £29 4s.
2. 81 hours.	2. 25 per cent.
3. £32 16s. 3d.	3. £46 13s. 4d.
4. $4\frac{3}{8}$ days.	4. 14s. and 7s.

No. 3.	No. 4.
1. 100 per cent.	1. 20 years.
2. 20 years.	2. 50 per cent.
3. £6,369 6s. 8d.	3. £175.
4. £100 and £150.	4. £33 15s.

No. 5.	No. 6.
1. £353 2s. $3\frac{3}{10}$d.	1. £66 2s. 6d.
2. £1 16s. 9d.	2. £3,304 3s. 4d.
3. £1,516 10s.	3. £$148\frac{4}{7}$.
4. £408 12s. $6\frac{3}{4}$d.	4. 12½.

No. 7.	No. 8.
1. 2½ hours.	1. £14 1s. 3d.
2. 19½.	2. 40 per cent.
3. 20 years.	3. 44·4 and 55·6.
4. £1,143 16s. 10½d.	4. £59 7s. 6d.

In our next issue will be found a complete set of Standard III. Test Sums for Girls.

(To be continued.)

Publications Received.

BELL, G., AND SONS.—A Simple Method of Grammatical Analysis (*Louisa Dreary*).

BLACKIE AND SON.—Elementary Latin Grammar: Part II.; Elementary Chemistry: Part III.; Three Hundred Dictation Exercises for Standards 4 to 7; The Century Historical Reader: Parts I. and II.; The Century Geographical Reader: No. 4; Familiar Objects of Everyday Life (*Hassell*).

CASSELL AND CO.—A complete Manual of Spelling (*Dr. Morell*).

CAMBRIDGE UNIVERSITY PRESS.—Elements of Statics and Dynamics: Part II. (*Lovey*).

CURWEN AND SONS—The Better Land (*Berger*); The Flower Bells (*Cowley*).

EDUCATIONAL SUPPLY ASSOCIATION.—The Practical Infant Reader: Nos. 1 and 2; Certificates.

FISHER UNWIN, T.—The Century Magazine. April.

GOTCH AND GOMME.—The French Examiner (*Millar*).

GRIFFITH, FARRAN, OKEDEN, AND WELSH.—Exercises in Speech and Recitations: Standards I. to V. (*Burrell*); Recitation Handbook (*Burrell*); Misty Veils; Fortunes Made in Business.

HEYWOOD, JOHN.—Die Urzeit; or, Kindergarten German (*Rev. Comerford Casey*).

HOLDEN, A. M.—The British Empire (*Meiklejohn*).

JOHNSON, W. AND A. K.—Illustrations of Trades: The Laundress; Natural History Plates: Squirrels.

LONGMANS AND CO.—Handbooks of Geography. No. 7.

MACMILLAN AND CO.—Two Years Ago (*Kingsley*).

PHILIP, G., AND SON.—Wilcock's Practical Drawing Cards; Young Folk's Song Book (Sol-Fa); Houghton's Arithmetical Drill Sheets; The Teacher's Helpful Book of Mental Arithmetic (*Piper*).

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